

### REMARKS

Claims 16-28 are pending in the present application. Claim 21 has been amended. No new matter is added. The rejections are respectfully traversed in light of the following amendments and remarks, and reconsideration is requested.

#### Rejection Under 35 U.S.C. § 112

Claim 21 is rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. In particular, the Examiner writes in part that "Claim 21 specifies that the aluminum content range from 10% to 100%, but if  $x=1.0$ , then the material becomes AlAs, which not 100% aluminum. It is unclear how one is to achieve 100% aluminum with the given chemical formula."

Claim 21 has been amended to recite " $x$  values of aluminum contents of said first  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  layer and said second  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  layer are ranged from 0.1 to 1 by atomic composition." Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

#### Rejections Under 35 U.S.C. § 103

Claims 16-28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Fafard et al. (U.S. Pat. No. 6,239,449 B1 hereinafter "Fafard") in combination with Imamura et al. (U.S. Pat. No. 5,936,258 hereinafter "Imamura") and Jewell et al. (U.S. Pat. No. 5,960,018 hereinafter "Jewell").

The working principles between the structure disclosed in Fafard and that of the present invention are very different, and two figures are submitted in Attachment A as illustrations of the differences.

In the quantum dot infrared photodetector (QDIP) disclosed in Fafard, the material of the barrier layer between the quantum dot structure layers can be  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  (where  $x$  ranges from 0 to 1), and the working principle of the barrier layer is to block the transition of the electrons in the quantum dots, as illustrated in Fig. 1 of Attachment A. However, as further illustrated in Fig. 1 of Attachment A, the barrier layer disclosed in Fafard cannot reduce the dark current caused by those electrons which originally exist in the conduction band. In

summary, the structure disclosed in Fafard cannot reduce the dark current and therefore cannot be operated at high temperatures.

In contrast, the present invention discloses barrier layers made of GaAs between the quantum dot structures, and two extra high band gap  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  layers formed at the two sides of the structure, as illustrated in Fig. 2 of Attachment A. The present invention discloses a structure which can block electrons that originally exist in the conduction band of GaAs layers, and therefore dark current can be reduced. However, these two additional high band gap layers do not block electrons which transit from the energy level E1 of quantum dots under illumination, and therefore, the intensity of the photocurrent remains unchanged while that of the dark current is reduced. Accordingly, the QDIP of the present invention can operate at a temperature as high as 240K, but that of Fafard can only operate at a temperature of about 100K because of the existence of dark current.

Imamura is an invention directed to an "Optical Semiconductor Memory Device and Read/Write Method Therefor" and is otherwise unrelated and nonanalogous to the art disclosed in Fafard. Imamura only discloses an InAs quantum dot structure which is formed in  $\text{Al}_x\text{Ga}_{1-x}\text{As}$ . Imamura does not disclose or suggest  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  formed as blocking layers. The design principle, structure, and characteristics disclosed in Imamura are thoroughly different from those of the present invention.

In contrast, Claim 16 recites, "a first undoped  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  layer as a blocking layer formed on said gallium arsenide layer; a quantum dot structure layer comprising a plurality of stacked layers formed on said first undoped  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  layer; a second undoped  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  layer as a second buffer layer formed on said quantum dot structure layer."

Similarly in contrast, Claim 23 recites, "a first undoped aluminum gallium arsenide layer as a blocking layer formed on said gallium arsenide layer; a quantum dot structure layer comprising a plurality of stacked layers formed on said first undoped aluminum gallium arsenide layer; a second undoped aluminum gallium arsenide layer as a second buffer layer formed on said quantum dot structure layer."

Imamura and Jewell do not correct the deficiencies of Fafard noted above. Accordingly, because Fafard in combination with Imamura and Jewell do not disclose or suggest all the limitations of Claims 16 and 23, Claims 16 and 23 are patentable over Fafard in combination with Imamura and Jewell.

Claims 17-22 and 24-28 depend upon Claims 16 and 23, respectively, and contain additional limitations that further distinguish them from the cited references. Thus, Claims 17-22 and 24-28 are patentable over Fafard in combination with Imamura and Jewell for at least the same reasons given above with respect to Claims 16 and 23, respectively.

LAW OFFICES OF  
MacPherson, Kwok, Chen &  
Eide LLP

2402 Michelson Dr., Suite 210  
Irvine, CA 92612  
(949) 732-7048  
FAX (949) 752-7049

CONCLUSION

For the foregoing reasons, Applicants believe pending Claims 16-28 are allowable, and a notice of allowance is respectfully requested. If the Examiner has any questions regarding the application, the Examiner is invited to call the undersigned Attorney at (949) 752-7040.

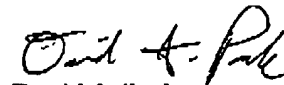
## CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this correspondence is being transmitted via facsimile to the attention of: Examiner Neal Berezny, Art Unit 2823, at facsimile number (703) 872-9319 for After Final communications, on October 8, 2003.

  
Adriane Giberson

October 8, 2003

Respectfully submitted,



David S. Park  
Attorney for Applicants  
Reg. No. 52,094

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LAW OFFICES OF  
MacPherson, Kwok, Chen &  
Seid LLP

2492 Michelson Dr. Suite 210  
Irvine, CA 92612  
(949) 752-7040  
FAX (949) 752-7049

ATTACHMENT A

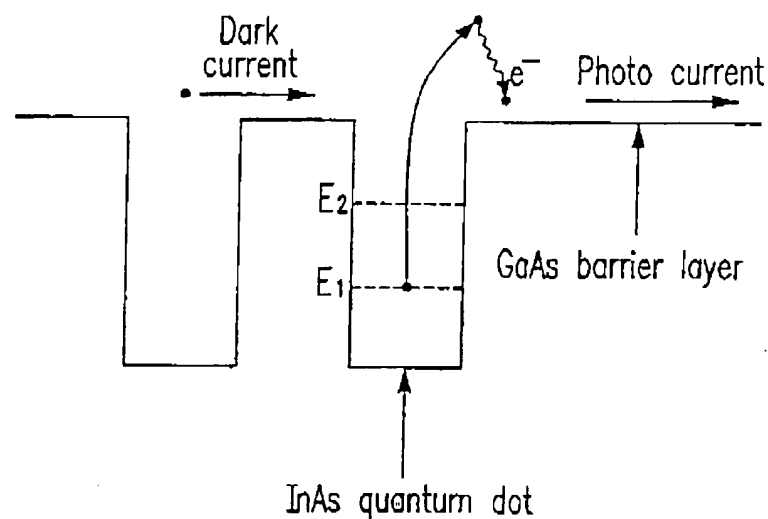


Fig. 1

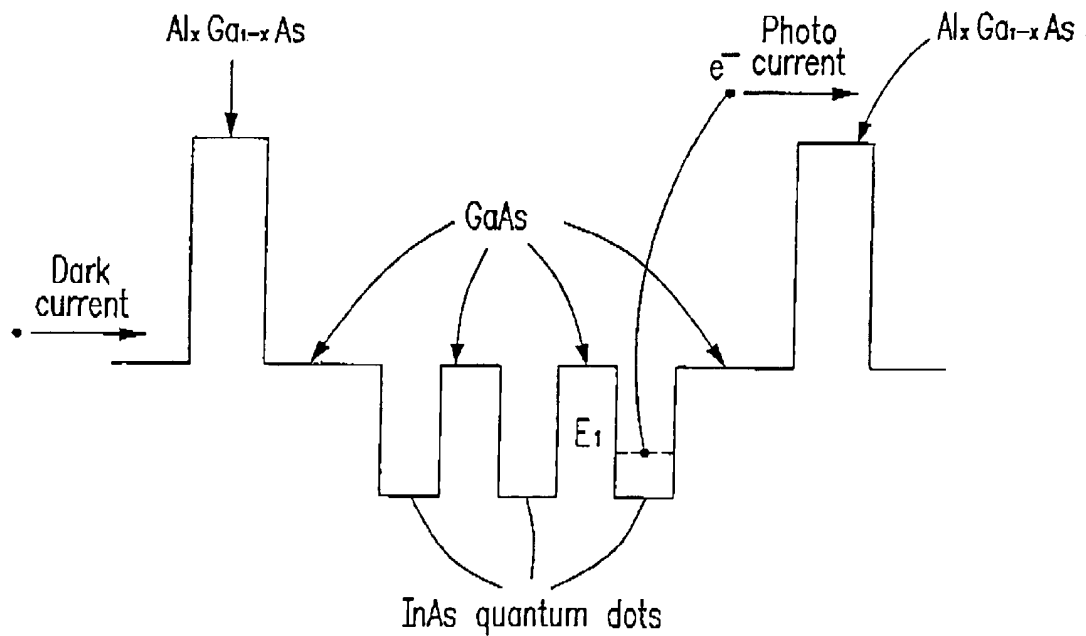


Fig. 2